电容式电压互感器

Capacitor Voltage Transformers

电 容 式 电 压 互 感 器

TRENCH CHINA

上海MWB互感器有限公司

MWB(SHANGHAI) CO.,LTD.

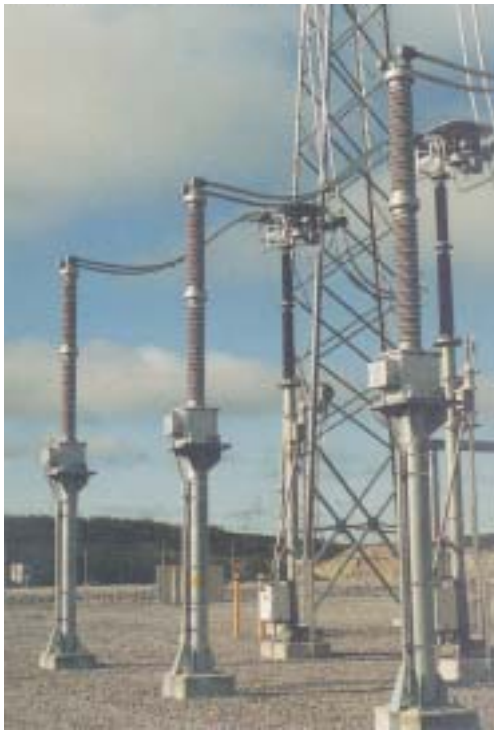
TRENCH

电容式电压互感器

Capacitor Voltage Transformer

Trench 公司在设计和制造高电压设备方面具有公认的世界领先地位，其产品主要应用于电力设施和高能工业系统中。作为 Trench 产品的一部分，公司生产多种电压等级的互感器产品，安装在69kV-800kV 的电力系统上。互感器的类型包括：电压互感 (包括电磁式和电容式)，电流互感器和组合式互感 (电压和电流互感器组装在同一产品內)。

CVT 能将传输线路的电压转换为易测量的标准的低电压，可用于高电压系统的测量、继电保护和自动控制。电压互感器的准确级和可靠性要求同样满足它。另外，CVT 还可作为耦合电容器将高频载波信号耦合到传 输线。本样本将详细介绍CVT的特性。



Introduction

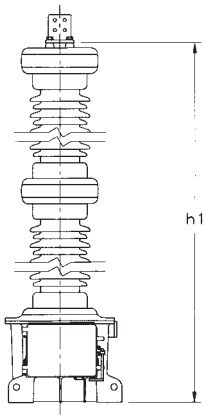
Trench is a recognized world leader in the design and manu-facture of high voltage equipment for application on electric utility and high-energy industrial systems. As part of Trench's product scope,the Company produces a diversified range of Instrument Transformers that are installed on 69-800kV electrical systems. Instrument Transformers include: Voltage(potential)Transformers (both inductive and capacitive type), Current Transform-ers and Combined Instrument Transformers (voltage and current transformer in one unit).

Capacitor Voltage Transformers must convert transsmission class voltages to standardized low and easily measurable values, which will be used for metering,protection and control of the high voltage system. As such, the need for accurate and reliable voltage transformation is essential. Additionally, Capacitor Voltage Transrormers serve as a coupling capacitor for coupling high frequency power line carrier signals to the transmision line.

This brochure will detail the features and characteristics Capacitor Voltage Transformers.

特　性

- 符合所有IEC、GB和ANSI测量和保护级的标准（也可提出符合其他标准的要求）
- 适用范围从69kV至800kV
- 质量保证体系符合 ISO9001
- 能将载波PLC信号耦合致电传输网上
- 优化的绝缘系统设计，运用先进科学的工艺处理技术来处理矿物油或合成绝缘液体
- 产品在长期的使用中具有稳定的电容量和准确度
- 油膨胀采用全密封的不锈钢膨胀腔，以保证长期使用中绝缘的完好
- 如果恶劣的运行条件造成互感器内部发生放电，膨胀腔内的刺针会刺穿膨胀腔释放内部压力
- 特殊的高强度瓷套，抗震能力强并能将线路陷波器直接安装在CVT上，安装成本相对较低
- 免维护的充油铸铝底箱
- 卓越的瞬变响应特性
- 本公司内部的出厂试验和质量要求均高于相应的国际标准
- 不会和电网或断路器断口电容发生铁磁谐振



Features

- Meet all IEC,GB and ANSI metering and protection classes (other standards on request)
- Applications from 69kV-800kV
- Quality Assurance in accordance with ISO9001
- Capable of carrier coupling PLC signals to the network
- Optimized insulation system design utilizing state-of-the-art processing techniques with either mineral oil or synthetic insulating fluids
- Stability of capacitance and accuracy over a long period of time due to superior clamping system design
- Oil expansion by way of hermetically sealed stainless steel bellows assures the integrity of the insulation system over time
- Bellows puncture pin provides for release of internal pressure in the event of severe service conditions leading to internal discharges
- Extra high strength porcelains provide both superior seismic performance and the ability to mount large line traps directly on the CVT with corresponding savings in installed cost
- Maintenance-free oil filled cast alunminum base box
- Superior transient response characteristics
- Internal company routine test and quality requirements exceed those of international standards
- Not subject to ferroresonance oscillations with the network or breaker capacitor

结 构

Trench 生产的CVT主要由两部分结构组成：高压电容器部分和放置电磁装置的底箱部分。

每个电容器由串联联接的电容器元件组成，放置在完全密封的瓷套内。电容器元件的绝缘由高质量的聚丙烯薄膜 / 纸质电介质构成，并填充经精细处理的人工合成液体。每个电容器顶部均配备有一个不锈钢的膨胀腔，使得充填的液体在运行环境温度变化时有伸缩的余地。一旦电容器内部出现过压，膨胀腔下部的刺针会刺穿膨胀腔释放内部压力并提供可视故障指示。加载在这些电容器(每个CVT有1-4个电容器)上的高电压将被降下。抽头电压(由型号决定，大约5-12kV)取自位置最低的那个电容器并接至位于铸铝底箱内的一个电磁回路上。底箱内包括一中间变压器，它通过多抽头的二次绕组提供最终的输出电压，底箱内还有串接的补偿电抗器和铁磁谐振控制回路。底箱内注入经干燥处理的矿物油，保护各部件不受环境的影响。

通过利用低磁通密度的磁路和一个跨接在二次绕组两端由饱和电抗器控制的阻尼电路就能简单而有效地控制铁磁谐振。铁磁揩振抑制电路不会反过来影响瞬变响应特性。

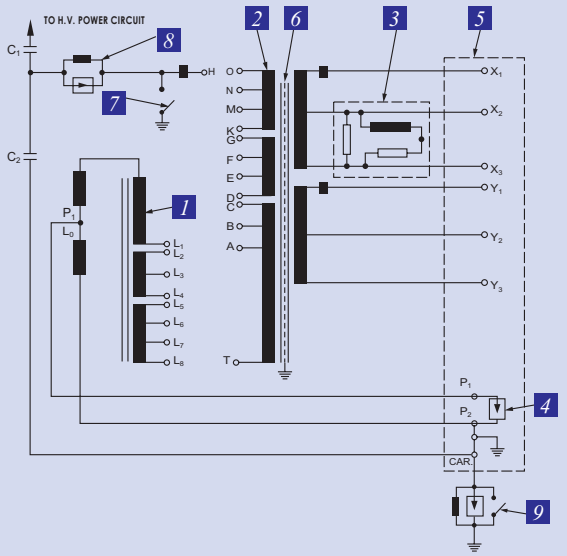
Construction

Trench CVT consists of two primary assemblies: the high voltage capacitor sections and the base box housing the electromagnetic components.

Series connected capacitor elements, housed in porcelain shells, each hermetically sealed, are referred to as capacitor sections. The capacitor elements are insulated with a high quality polypropylene film/paper dielectric and impregnated with highly processed synthetic fluid. Each capacitor section is equipped with a stainless steel expansion chamber which will allow the synthetic fluid to expand and contract with changes in ambient operation temperatures. Should there be excessive pressure build up within a capacitor section, the expansion chamber will engage a puncture pin, resulting in pressure release and visual indication of a problem. It is over these capacitor sections (1-4 capacitor sections per CVT) that most of the high voltage will be dropped.

A tap voltage (approximately 5-12 kV depending on type) is taken from the lowest capacitor section and fed to an electromagnetic circuit in the cast aluminum base box.The base box contains the intermediate transformer which will provide the final output voltage via multiple tapped secondary windings, series compensation reactor and ferroresonance control circuitry. The base box is filled with dried mineral oil, protecting the components for environmental deterioration.

Ferroresonance is simply and effectively controlled by utilization of low flux density designed magnetic circuitry and a saturable reactor controlled damping circuit connected across the secondary Winding. The ferroresonance suppression cirouit does not adversely affect transient respons.



注：内部端子的连接在工厂内完成。

图3 典型的CVT接线示意图

1、串联电抗器
2、中间变压器
3、防谐振装置
4、保护间隙
5、二次接线板
6、法拉第屏蔽
7、电压分接接地开关
8、扼流线圈和保护间隙装置
9、排流线圈，保护间隙和载波接地开关装置

NOTE: connection between internal terminals are made at the factory as required for each unit.

Fig.3 Typical schematic diagram of a Capacitor Voltage Transformer

1 Series reactor
2 Intermediate voltage transformer
3 Harmonic suppression filter
4 Protective gap
5 Secondary terminal board
6 Faraday shield
7 Potential ground switch
8 Choke coil and gap assembly
9 Drain coil, gap and carrier ground switch assembly

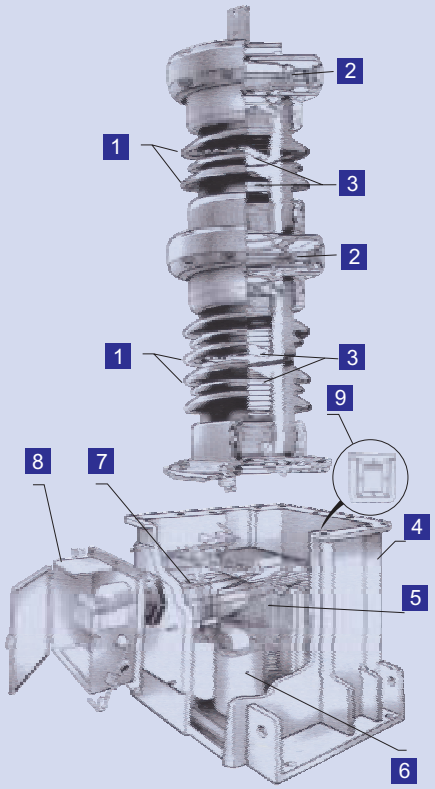


图4 典型的CVT剖面图

1. 瓷套
2. 充油膨胀腔
3. 电容器元件
4. 充油底箱
5. 中间变压器
6. 串联电抗器
7. 阻尼器
8. 低压接线盒
9. 油位侧视镜

Fig.4 Sectioned view of a typical Capacitor Voltage Transformer

1 Porcelain Shell
2 Oil Filled Expansion Chamber
3 Capacitor Rolls
4 Oil Filled Base Box
5 Intermediate Transformer
6 Series Reactor
7 Stabilizing Burden
8 Low Voltage Terminal Box
9 Oil Level Side Glass

69kV电容式电压互感器技术规格[1]

69kV CAPACITOR VOLTAGE TRANSFORMER TECHNICAL SPECIFICATION

额定电压 System Voltage	(KV)		69	
设备系统最高电压 Max System Voltage	(KV)		72.5	
工频耐受电压(50Hz) Withstand Voltage(50Hz)	(KV)		140	
BIL	(KV)		325	
SIL	(KV)		...	
产品型号 Product Type			TEMP-69SU	TEMP-69SU
电容量 Capacitance	(pF)		10000	20000
爬电距离 Creepage Distance	(mm)		1815	
闪络距离 Flashover Distance	(mm)		580	
瓷套颜色 Porcelain Color			棕 色 BROWN	
主绕组的总负荷（VA） Main Winding Total Burden		0.2	100	225
		0.5	250	500
		1/3P	500	700
剩余绕组 Residual Winding		3P	100	100
热极限输出 Thermal rating	(VA)		1000	1000
130km/h风速时最大水平端子拉力(N) Max,Horzontal Terminal Pull in 130km/h Wind			15570	
高度 Total Height	h1(mm)		1403	
重量 Weight	(kg)		341	

注：(1)产品带有两个主二次绕组供选用，另外还带有一个剩余电压绕组可供选用。
Two main windings are supplied as standard, with a third auxiliary winding available as an optional extra.

(2)选用二个主二次绕组时，其负荷之和不能大于较高或同等精度的一个主二次绕组所对应的负荷值。
The accuracy class for total simultaneous loading is equal to the values for each main winding.

注[1]：其它参数根据用戶要求与制造厂协商确定(其余电压等级产品均同此)
Other ratings available on request (Also for other voltage level)

110kV电容式电压互感器技术规格

110kV CAPACITOR VOLTAGE TRANSFORMER TECHNICAL SPECIFICATION

额定电压 System Voltage	(KV)	110			
设备系统最高电压 Max,System Voltage	(KV)	126			
工频耐受电压(50Hz) Withstand Voltage(50Hz)	(KV)	230			
BIL	(KV)	550			
SIL	(KV)	...			
产品型号 Product Type		TEMP-110SU	TEMP-110SU	TEMP-110IU	TEMP-110HU
电容量 Capacitance	(pF)	7000,8000,10000	15000	20000	40000
爬电距离 Creepage Distance	(mm)	3150	3150	3150	3150
闪络距离 Flashover Distance	(mm)	930	980	940	940
瓷套颜色		棕 色			
Porcelain Color		BROWN			
主绕组的总负荷（VA）	0.2	200	250	300	350
Main Winding	0.5	500	500	600	700
Total Burden	1/3P	700	700	1000	1000
剩余绕组 Residual Winding	3P	100	100	100	100
热极限输出 Thermal rating	(VA)	1000	1000	1500	1500
130km/h风速时最大水平端子拉力(N) Max,Horzontal Terminal Pull in 130km/h Wind		11340	9680	21130	21300
高度 h1(mm) Total Height		1759	1813	1822	1810
重量 Weight	(kg)	295	306	442	499

注： (1)产品带有两个主二次绕组供选用，另外还带有一个剩余电压绕组可供选用。

Two main windings are supplied as standard, with a third auxiliary winding available as an optional extra.

(2)选用二个主二次绕组时，其负荷之和不能大于较高或同等精度的一个主二次绕组所对应的负荷值。

The accuracy class for total simultaneous loading is equal to the values for each main winding.

138kV电容式电压互感器技术规格

138kV CAPACITOR VOLTAGE TRANSFORMER TECHNICAL SPECIFICATION

额定电压 System Voltage	(KV)		138	
设备系统最高电压 Max,System Voltage	(KV)		145	
工频耐受电压(50Hz) Withstand Voltage(50Hz)	(KV)		275	
BIL	(KV)		650	
SIL	(KV)		...	
产品型号 Product Type			TEMP-138SU	TEMP-138SU
电容量 Capacitance	(pF)		5000	10000
爬电距离 Creepage Distance	(mm)		3680	
闪络距离 Flashover Distance	(mm)		1370	
瓷套颜色			棕 色	
Porcelain Color			BROWN	
主绕组的总负荷（VA）		0.2	100	200
Main Winding		0.5	250	500
Total Burden		1/3P	500	700
剩余绕组 Residual Winding		3P	100	100
热极限输出 Thermal rating	(VA)		1000	1000
130km/h风速时最大水平端子拉力(N) Max,Horzontal Terminal Pull in 130km/h Wind			8450	
高度 Total Height	h1(mm)		2191	
重量 Weight	(kg)		329	

注：(1)产品带有两个主二次绕组供选用，另外还带有一个剩余电压绕组可供选用。

Two main windings are supplied as standard, with a third auxiliary winding available as an optional extra.

(2)选用二个主二次绕组时，其负荷之和不能大于较高或同等精度的一个主二次绕组所对应的负荷值。

The accuracy class for total simultaneous loading is equal to the values for each main winding.

220kV电容式电压互感器技术规格

220kV CAPACITOR VOLTAGE TRANSFORMER TECHNICAL SPECIFICATION

系统电压 System Voltage	(KV)	220			
系统最高电压 Max,System Voltage	(KV)	252			
工频耐受电压(50Hz) Withstand Voltage(50Hz)	(KV)	460			
BIL	(KV)	1050			
SIL	(KV)	...			
产品型号 Product Type		TEMP-220SU	TEMP-220SU	TEMP-220IU	TEMP-220HU
电容量 Capacitance	(pF)	3500,4000, 5000	7500	10000	20000
爬电距离 Creepage Distance	(mm)	6300		6300	6300
闪络距离 Flashover Distance	(mm)	1860	1960	1880	1880
瓷套颜色 Porcelain Color		棕 色 BROWN			
主绕组的总负荷（VA） Main Winding Total Burden	0.2 0.5 1/3P	200 500 700	250 500 700	300 600 1000	350 700 1000
剩余绕组 Residual Winding	3P	100	100	100	100
热极限输出 Thermal rating	(VA)	1000	1000	1500	1500
130km/h风速时最大水平端子拉力(N) Max,Horzontal Terminal Pull in 130km/h Wind		5780	12230	12230	12230
高度 Total Height	h1(mm)	2953	3060	3089	3092
重量 Weight	(kg)	397	408	612	748

注：(1)产品带有两个主二次绕组供选用，另外还带有一个剩余电压绕组可供选用。

Two main windings are supplied as standard, with a third auxiliary winding available as an optional extra.

(2)选用二个主二次绕组时，其负荷之和不能大于较高或同等精度的一个主二次绕组所对应的负荷值。

The accuracy class for total simultaneous loading is equal to the values for each main winding.

330kV电容式电压互感器技术规格

330kV CAPACITOR VOLTAGE TRANSFORMER TECHNICAL SPECIFICATION

系统电压 System Voltage	(KV)	330		
系统最高电压 Max,System Voltage	(KV)	363		
工频耐受电压(50Hz) Withstand Voltage(50Hz)	(KV)	510		
BIL	(KV)	1175		
SIL	(KV)	...		
产品型号 Product Type		TEMP-330SU	TEMP-330IU	TEMP-330HU
电容量 Capacitance	(pF)	4000	7500	15000
爬电距离 Creepage Distance	(mm)	9075	9075	9075
闪络距离 Flashover Distance	(mm)	2610	2690	2740
瓷套颜色 Porcelain Color		棕 色 BROWN		
主绕组的总负荷（VA） Main Winding Total Burden	0.2 0.5 1/3P	250 500 700	300 600 1000	350 700 1000
剩余绕组 Residual Winding	3P	100	100	100
热极限输出 Thermal rating	(VA)	1000	1500	1500
130km/h风速时最大水平端子拉力(N) Max,Horzontal Terminal Pull in 130km/h Wind		4110	8450	9340
高度 h1(mm) Total Height		3816	3773	3950
重量 Weight	(kg)	454	725	896

注：(1)产品带有两个主二次绕组供选用，另外还带有一个剩余电压绕组可供选用。

Two main windings are supplied as standard, with a third auxiliary winding available as an optional extra.

(2)选用二个主二次绕组时，其负荷之和不能大于较高或同等精度的一个主二次绕组所对应的负荷值。

The accuracy class for total simultaneous loading is equal to the values for each main winding.

550kV电容式电压互感器技术规格

550kV CAPACITOR VOLTAGE TRANSFORMER TECHNICAL SPECIFICATION

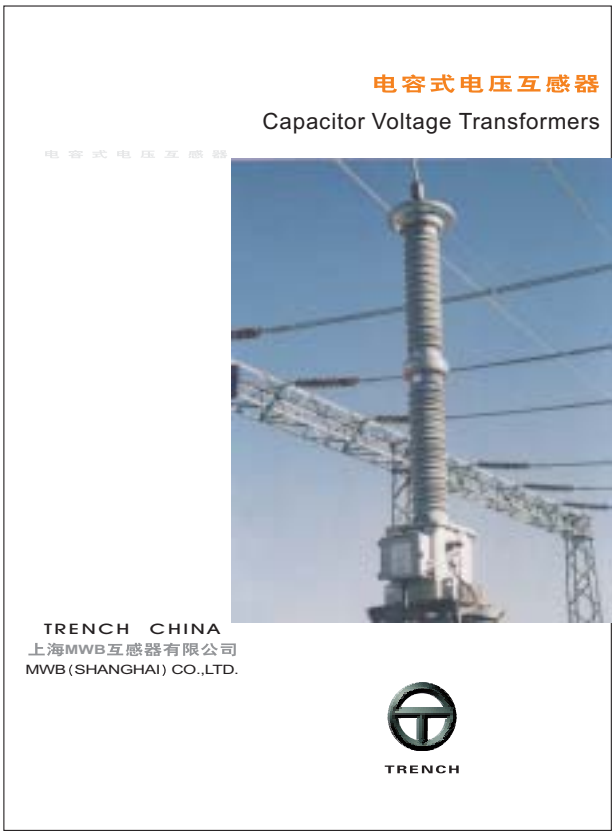
系统电压 System Voltage	(KV)	500	
系统最高电压 Max,System Voltage	(KV)	550	
工频耐受电压(50Hz) Withstand Voltage(50Hz)	(KV)	740	
BIL	(KV)	1675	
SIL	(KV)	1300	
产品型号 Product Type		TEMP-500IU	TEMP-550HU
电容量 Capacitance	(pF)	5000	10000
爬电距离 Creepage Distance	(mm)	13750	13750
闪络距离 Flashover Distance	(mm)	4030	4110
瓷套颜色		棕 色	
Porcelain Color		BROWN	
主绕组的总负荷（VA）	0.2	300	350
Main Winding	0.5	600	700
Total Burden	1/3P	1000	1000
剩余绕组 Residual Winding	3P	100	100
热极限输出 Thermal rating	(VA)	1500	1500
130km/h风速时最大水平端子拉力(N) Max,Horzontal Terminal Pull in 130km/h Wind		5330	6120
高度 h1(mm) Total Height		5533	5664
重量 Weight	(kg)	940	1225

注：(1)产品带有两个主二次绕组供选用，另外还带有一个剩余电压绕组可供选用。

Two main windings are supplied as standard, with a third auxiliary winding available as an optional extra.

(2)选用二个主二次绕组时，其负荷之和不能大于较高或同等精度的一个主二次绕组所对应的负荷值。

The accuracy class for total simultaneous loading is equal to the values for each main winding.



- ☐ **Trench Austria GmbH**
  Linz-Leonding
  Austria

- ☐ **Trench Brasil LTDA**
  MinasGerais
  Brasil

- ☐ **Trench Limited**
  Coil Product Division
  Ontario Canada

- ☐ **Trench Limited**
  Instrument Transformer Division
  Ontario Canada

- ☐ **Trench France S.A.**
  St-Louis Cedex
  France

- ☐ **Trench Germany GmbH**
  Bamberg
  Germany

- ☐ **Trench Switzerland AG**
  Basel
  Switzerland

- ☐ **Trench(UK)Linmited**
  Hebburn

www.trenchgroup.com

TRENCH

传奇(中国)
上海MWB互感器有限公司
地址: 上海闵行经济技术开发区
江城路3658号
电话: +86-21-54720088(总机)
+86-21-54726918(直线)
传真: +86-21-54723118
电子信箱: sama@trenchcn.com
邮编: 200245

Trench China
MWB (Shanghai) Co.,Ltd.
No.3658 Jiangcheng Rd.
Minhang Economic and
Tecnnological Development
Zone Shanghai P.R.China
Tel: +86-21-54720088
+86-21-54726918
Fax: +86-21-54723118
E-mail: sama@trenchcn.com
P.C: 200245